REMARKS/ARGUMENTS

The specification is amended to correct technical errors. Specifically, as shown in Figure 3, reference numeral 304, the light from lens 303 is focused rather than collimated. Applicants note that the light emitted from the end of the large core multimode fiber optic cable is collimated by the action of the fiber; however, the lens itself is focusing light rather than collimating light.

Claims 21-37 are pending. Claims 1-20 are canceled. Claims 21, 22, 26, 32, and 35 are amended to appropriately indicate that the claimed lens focuses, rather than collimates, the claimed source light. Support for the claim amendments can be found in the specification as filed and in Figure 3, reference numerals 303 and 304. No new matter is added.

Applicants do not concede that the claims as originally filed are not patentable over the cited references. Instead, the claim amendments presented herein are provided only to correct a technical informality. As detailed below, Applicants traverse all rejections as being incorrect.

A. GROUND OF REJECTION 1

The Examiner failed to state a *prima facie* obviousness rejection under 35 U.S.C. § 103 against claims 21, 22, 25, 28, 31-35, and 37 in view of *Numata* in view of *Siegman* in view of *Aoki*.

A.1. Claims 21, 22, and 25-28

Applicants first address claims 21, 22, and 25-28. Claim 21 is a representative claim of this grouping of claims. Claim 21 is as follows:

> 21. A system for transmitting data at a data rate of at least 10 gigabits per second by preferentially launching input power into a large core multimode fiber optic cable (LCMFOC) to increase a length/data rate product of the LCMFOC, the system comprising:
>
> a light source for transmitting data from a source as a first light signal, wherein the first light signal comprises a sequence of short light pulses at a data rate of at least 10 gigabytes per second;
>
> a lens having a focal length (f), placed in a path of said first light signal at a distance of approximately said focal length (f) from an end of said LCMFOC, wherein the lens is located to receive said first light signal from said light source and to focus said short light pulses onto the end of the LCMFOC such that a diameter of focused short light pulses is approximately equal to a core diameter of the LCMFOC to excite low fiber modes and minimize excitation of higher order fiber modes in the LCMFOC,
>
> wherein the LCMFOC is designed to decrease higher order fiber modes which increase pulse spreading that limit the length/data rate product and to thereby increase a transmission distance through the LCMFOC and output second light pulses which include substantially only lower order fiber modes, wherein the LCMFOC comprises:

an exposed core having the core diameter which receives the focused short light pulses; and

a selected doped cladding layer around said exposed core which is selected to excite low order fiber modes of the LCMFOC as said focused short light pulses propagate down the LCMFOC and to absorptively attenuate higher order fiber modes generated in said LCMFOC as said focused short light pulses propagate down the LCMFOC, such that: said focused short light pulses propagate through the LCMFOC with reduced short pulse spreading effects that limit a length/data rate product of said LCMFOC.

In rejecting claim 21, the Examiner stats that:

> Regarding claims 21, 26, 31, 33, 34, and 37, Numata teaches a light source (reference numeral III in Figure 1) for transmitting data from a source as a first light signal, wherein the first light signal comprises a sequence of short light pulses (paragraph [0008]); a lens (reference numeral 112 in Figure 1) having a focal length, placed in a path of said first light signal at a distance of approximately said focal length from an end of said LCMFOC (reference letter Z1 in Figure 2), wherein the lens is located to receive said first light signal from said light source and to collimate and focus said short light pulses onto the end of the LCMFOC such that a diameter of focused short light pulses is approximately equal to a core diameter of the LCMFOC to excite low fiber modes and minimize excitation of higher order fiber modes in the LCMFOC (paragraphs [0051], [0055] , wherein the LCMFOC is designed to decrease higher order fiber modes (paragraph [0051]; Figure 9) which increase pulse spreading that limit the length/data rate product and to thereby increase a-transmission distance through the LCMFOC and output second light pulses which include substantially only lower order fiber modes, wherein the LCMFOC comprises: an exposed core having the core diameter which receives the focused short light pulses (inherent in Figures 1 & 2). Numata differs from the claimed invention in that Numata fails to disclose two aspects of the claimed invention.
>
> First, Numata fails to specifically teach using a step index fiber optic cable having a doped cladding layer for absorptive attenuation of higher order modes. However, Siegman, from the same field of endeavor discloses the use of a step index fiber optic cable having a doped cladding layer for absorptive attenuation of higher order modes (column 1 lines 36-47; column 3 lines 47-58; column 7 lines 60-61; column 11 lines 50-54; e.g. "index-antiguiding" throughout). One skilled in the art would have been motivated to employ a step index fiber optic cable having a doped cladding layer for absorptive attenuation of higher order modes in order to reduce the amount of mode mixing and randomizing of propagating modes to reduce dispersion (column 7 lines 1-15 of Siegman). Therefore, it would have been obvious to one skilled in the art at the time the invention was made to use a step index fiber optic cable having a doped cladding layer for absorptive attenuation of higher order modes as taught by Siegman in the device of Numata.
>
> Second, Numata fails to specifically teach that said light source transmits data at greater than 10 gigabits per second. However, Aoki teaches that this concept is well known in the art and common (column 1 lines 45-50). One skilled in the art would have been motivated to include a transmitter with the ability to transmit at

> greater than 10 gigabits in order to transfer a large amount of information in a short period of time. Therefore, it would have been obvious to one skilled in the art at the time the invention was made to include a light source that transmits data at greater than 10 gigabits per second.

Final Office Action of November 14, 2007, pp. 2-3.

The Examiner bears the burden of establishing a *prima facie* case of obviousness based on prior art when rejecting claims under 35 U.S.C. § 103. *In re Fritch*, 972 F.2d 1260, 23 U.S.P.Q.2d 1780 (Fed. Cir. 1992). The prior art reference (or references when combined) must teach or suggest all the claim limitations. *In re Royka,* 490 F.2d 981, 180 USPQ 580 (CCPA 1974). In determining obviousness, the scope and content of the prior art are... determined; differences between the prior art and the claims at issue are... ascertained; and the level of ordinary skill in the pertinent art resolved. Against this background the obviousness or non-obviousness of the subject matter is determined. *Graham v. John Deere Co.*, 383 U.S. 1 (1966). "Often, it will be necessary for a court to look to interrelated teachings of multiple patents; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by a person having ordinary skill in the art, all in order to determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue." *KSR Int'l. Co. v. Teleflex, Inc.*, No. 04-1350 (U.S. Apr. 30, 2007). "*Rejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.* Id. (citing *In re Kahn*, 441 F.3d 977, 988 (CA Fed. 2006))."

A.1.i The Proposed Combination Does Not Teach a System Having a Lens Placed at the Claimed Focal Length Distance

Under the standards of *In re Royka*, the Examiner failed to state a *prima facie* obviousness rejection against claim 21 because the combination, considered as a whole, fails to teach or suggest the claimed feature of, "a lens having a focal length (f), placed in a path of said first light signal at a distance of approximately said focal length (f) from an end of said LCMFOC, wherein the lens is located to receive said first light signal from said light source and to focus said short light pulses onto the end of the LCMFOC such that a diameter of focused short light pulses is approximately equal to a core diameter of the LCMFOC to excite low fiber modes and minimize excitation of higher order fiber modes in the LCMFOC." The Examiner asserts otherwise, citing Figure 2 of *Numata*, as well as paragraphs 0051 and 0055 of *Numata*. However, *Numata* explicitly contracts the Examiner's assertions.

Again, claim 1 requires that the lens be placed at a distance of approximately the focal length of the lens from the end of the cable. *Numata* explicitly contradicts the Examiner on this point:

> [0036] In FIG. 1, the MMF 12 is a glass fiber of a graded index type, a polymer cladding fiber, or a plastic optical fiber. As shown in FIG. 2, the MMF 12 includes a core 121 and a cladding 122. A connector plug 123 is affixed to one end of the MMF 12 around the outer periphery thereof. The connector plug 123 is fitted into the receptacle 113 of the transmitter 11. As a result, as shown in FIG. 2, the fiber axis A.sub.fr of the MMF 12 and the optical axis A.sub.lz of the lens 112 are aligned with each other, and one of the end faces of the core 121 (hereinafter referred to as an "input plane F.sub.in") is positioned at a predetermined distance Z.sub.1 from the vertex Z.sub.0 of the lens 112 along the fiber axis A.sub.fr. *The distance **Z.sub.1** is set at a value which is **not equal** to the distance from the vertex **Z.sub.0** to the focal point **Z.sub.fp**, and preferably set at a value greater than the distance from the vertex Z.sub.0 to the focal point Z.sub.fp.*

Numata, paragraph 0036 (emphasis supplied).

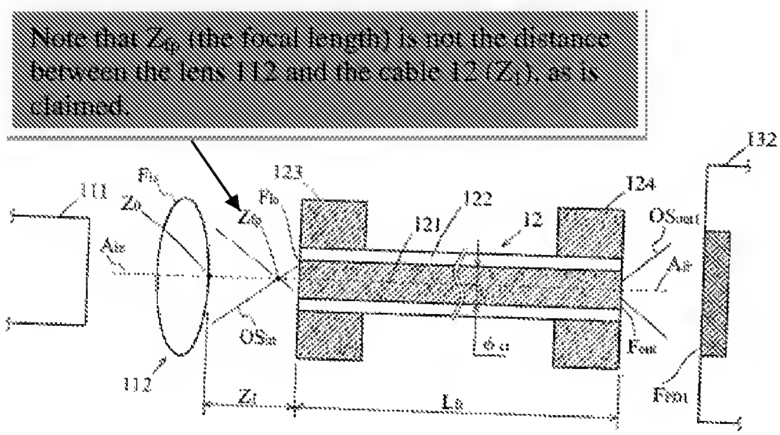


FIG. 2

Figure 2 of *Numata* shows that the focal point (Z_{fp}) of lens 112 is not at a distance of approximately the focal length (Z_{fp}) of the lens from the end of the cable 12. In fact, not only does Figure 2 show this fact, but *Numata* explicitly provides that the distance (Z_1) between the lens 112 and the cable 12 is not equal to the distance between the lens 112 (shown as Z_0) and the focal point Z_{fp}. The Examiner's assertion is contrary to the plain disclosures of *Numata*; hence, the rejection is incorrect.

The Examiner's assertions regarding paragraphs 0051 and 0055 are also plainly incorrect. Paragraph 0051 is as follows:

> [0051] Usually, the above-defined NA.sub.f is determined by the refractive indices of the core 12 and the cladding 122, and is a parameter which is independent of the aforementioned NA.sub.s. If light having a numerical aperture greater than the NA.sub.f enters the input plane F.sub.in, any components which spread outside the aforementioned range of propagation angles of the MMF 12 will be transmitted through to the exterior of the MMF 12. On the other hand, if the optical signal OS.sub.in has a numerical aperture smaller than the NA.sub.f, then all components of the light will propagate through the core 12 as explained above. Moreover, since the optical signal OS.sub.in has a smaller numerical aperture than the NA.sub.f in this case, the higher-order modes in the optical signal OS.sub.in are decreased, so that the mode dispersion can be reduced.

Numata, paragraph 0051.

This text is irrelevant to the question of the distance between the lens and the cable. Claim 1 requires that distance to be approximately equal to the focal length. The above-quoted text describes the effect of the *numerical aperture* (NA) of the cable and of the light source. *Numata* provides that the numerical aperture of the cable (NA.sub.f) describes the only components which propagate to the output plane F.sub.out. *Numata*, paragraph 0051. The numerical aperture of the cable is determined by the refractive indices of the *core* and the *cladding* of the cable; thus, the numerical aperture of the cable is only associated with the cable. Plainly, this value has nothing to do with the distance between the lens and the cable.

The numerical aperture of the light source is NA.sub.s. In paragraph 0048 *Numata* defines this value to be equal to the sine of the angle alpha, shown in Figure 5. In this context, consider the other irrelevant portion of *Numata* cited by the Examiner:

> [0055] First, the case in which the NA.sub.s is equal to or less than the NA.sub.f will be considered. In this case, all of the components of the optical signal OS.sub.in which have passed through the lens 112 and which enters the core 12 are propagated to the output plane F.sub.out. If S(Z.sub.1) is equal to or greater than S.sub.f, NA.sub.in (Z.sub.1) decreases as Z.sub.1 increases, as expressed by equation (4) below: 1 NA in (Z 1) = sin th = sin ((arctan (cr 2 | Z 1 - Z fp |))) ; S (Z 1) S f (4)

Numata, paragraph 0055.

Numata is comparing various ratios of the numerical aperture of the source and the numerical aperture of the cable. In paragraph 0055, *Numata* considers the case where the ratio is about equal, or NA.sub.s is about equal to or less than NA.sub.f. However, given the definitions of these values, *Numata* is plainly not discussing the distance between the lens and the cable at all. In fact, this portion of *Numata* is utterly irrelevant to claim 1.

Still further, *Numata* does not teach that the lens focuses the light from the source onto the end of the cable such that the diameter of focused light is approximately equal to the core diameter. As shown in Figure 2 and Figure 5 of *Numata*, the Examiner's assertions to the contrary are manifestly wrong. This fact is further proved with respect to A.3.i. of this brief.

As shown above, *Numata* explicitly contradicts the Examiner's assertions that *Numata* teaches the claimed feature of, "a lens having a focal length (f), placed in a path of said first light signal at a distance of approximately said focal length (f) from an end of said LCMFOC, wherein the lens is located to receive said first light signal from said light source and to focus said short light pulses onto the end of the LCMFOC such that a diameter of focused short light pulses is approximately equal to a core diameter of the LCMFOC to excite low fiber modes and minimize excitation of higher order fiber modes in the LCMFOC." For this reason, *Numata* does not teach or suggest this claimed feature.

Additionally, neither *Siegman* nor *Aoki* teach or suggest this claimed feature, and the Examiner does not assert otherwise. Still further, neither *Edvold* nor *White* teach or suggest this claimed feature. Therefore, no combination of the cited references, considered as a whole, teaches or suggests this claimed feature. Therefore, under the standards of *In re Royka*, the Examiner failed to state a *prima facie* obviousness rejection against claim 21 or any other claim in this grouping of claims.

A.1.ii. *Numata* Teaches Away from the Claimed Invention

In addition, the Examiner has failed to establish a *prima facie* obviousness rejection against claim 21 because *Numata* directly teaches away from the invention of claim 21. Thus, no reason exists to achieve the legal conclusion that claim 21 is obvious in view of the references considered as a whole, as required by *KSR Intl.*

A reference may be said to "teach away" from the claimed invention when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant. *In re Gurley*, 27 F.3d 551, 553, 31 U.S.P.Q.2D 1130, 1131 (Fed. Cir. 1995).

In this case, *Numata* discloses that the influence of mode dispersion is reduced ***because*** *the focal length of the lens is less than the distance between the lens and the cable*. *Numata*, Abstract, penultimate sentence. In direct contrast, claim 21 requires that the distance between the lens and the cable be at the focal length of the lens. Specifically, claim 21 requires, "*a lens having a focal length (f), placed* in a path of said first light signal *at a distance of approximately said focal length (f) from an end of said LCMFOC*."

One of ordinary skill, upon reading *Numata* would believe that the claimed invention *would not work* because *Numata* teaches that the resulting decrease in mode dispersion is achieved by placing the lens at a location where the focal length is less than the distance between the lens and the cable. Thus, one of ordinary skill would be led in a direction divergent from the path that was taken by Applicants.

Accordingly, under *In re Gurley, Numata* teaches away from claim 21. For this reason, no rational underpinning exists to achieve the legal conclusion of obviousness under *KSR Intl.* Accordingly, the Examiner failed to state a *prima facie* obviousness rejection against claim 21 or any other claim in this grouping of claims.

A.1.iii. *Aoki* Does Not Teach what the Examiner Asserts *Aoki* To Teach Vis-à-Vis Claim 21

The Examiner cites *Aoki* for the proposition that transmission rates of 10 gigabits per second are well known. Final Office Action of November 14, 2007, p. 3. However, at least vis-à-vis claim 21, the Examiner is again plainly wrong because the Examiner fails to recognize the differences between normal optical fibers and large core multimode fiber optic cables.

Aoki teaches that the typical transmission speed in a long-distance main line system is currently 2.5 gigabits per second to 10 gigabits per second. *Aoki*, col. 1, ll. 45-46 (also cited by the Examiner). However, the Examiner ignored the portion of *Aoki* that states that such speeds are obtained in *main line systems*. These systems are not large core multimode fiber optic cables, as claimed.

Large core multimode fiber optic cables are not main line optical systems. For example, Applicants' specification provides as follows:

> Another type of fiber optic cable is a large core multimode cable. The large core multimode cable typically has a core size on the order of or greater than 50 microns. Common sizes for a large core multimode cable are 50, 62.5, and 100 micron diameters. In general, the preferred light source for transmission in a large core multimode cable is 850 and 1300 nanometers. As its name implies, large core multimode cable allows light waves to be dispersed into numerous paths or modes that travel down the cable core. *The multiple modes travel at different phase velocities and hence produce waveform distortion and noise at the receiving end. The distortion becomes a significant issue for greater distances, and thus multimode cable has been found not to be suitable for long distance applications.* ***The multiple modes also reduce the speed at which data can be transmitted.***

Applicants' Specification, paragraph 0005 (emphasis supplied).

The specification goes on to state that:

> Large core multimode fiber optic cable is an alternative to single mode fiber optic cable for low to midrange distances. Currently, large core multimode fiber optic cables are performance limited in length/data rate product. This will be discussed in more detail hereinbelow. In general, a core diameter of a large core multimode fiber optic cable is greater than 50 microns whereas a single mode core is typically 10 microns or less. ***In conventional systems, an upper limit for the data transfer rate of a large core multimode fiber optic cable is in the range of 1-10 gigabit per second*** and it is useful for applications less than 1000 meters in length without repeaters that regenerate the signal. The wavelength of light used for data transmission in a large core multimode fiber optic cable is typically greater than 750 nanometers.

Applicants' Specification, paragraph 0016 (emphasis supplied).

Aoki teaches that in *main line systems* data rates between 2.5 and 10 Gb/s (gigabits) can be obtained. Applicants' specification is in concurrence with this teaching. However, the Examiner fails to realize that in the claimed large core multimode cable, such data transmission rates *are limited to this speed*. Thus, the Examiner's citation to *Aoki* is misplaced.

In fact, *Aoki* does not teach the claimed feature of, "wherein the first light signal comprises a sequence of short light pulses at a data rate of at least 10 *gigabytes* per second." Note that the term "gigabyte" is used, an amount which is greater than a "gigabit." Therefore, the claimed range is outside the range taught by *Aoki*, even if *Aoki* had any relevance to large core multimode cables, as claimed. In fact,

Aoki is irrelevant to claim 21, because *Aoki* contains no teachings regarding large core multimode cables, as in claim 21.

The Examiner admits that *Numata* does not teach or suggest this claimed feature. Additionally, *Siegman* does not teach this claimed feature, and the Examiner does not assert otherwise. Still further, neither *White* nor *Edvold* teach or suggest this claimed feature. As shown above, *Aoki* does not teach or suggest this claimed feature and, even if *Aoki* did suggest this claimed feature, the citation to *Aoki* is misplaced. Hence, the combination of references, considered as a whole, does not teach or suggest this claimed feature. Therefore, under the standards of *In re Royka*, the Examiner failed to state a *prima facie* obviousness rejection against claim 21 or any other claim in this grouping of claims.

A.1.iv. No Rational Underpinning Exists To Achieve the Legal Conclusion of Obviousness

Additionally, no rational underpinning exists to achieve the legal conclusion of obviousness of claim 21, as required by *KSR Intl.* Given that *Numata* explicitly contradicts claim 21 and given that *Aoki* is irrelevant to claim 21, no rational underpinning can exist to achieve the legal conclusion that claim 21 is obvious in view of the combination of references considered as a whole. Accordingly, under *KSR Intl.*, the Examiner failed to state a *prima facie* obviousness rejection against claim 21 or any other claim in this grouping of claims.

A.2. Claims 31 and 32

Applicants next address the rejection of claims 31 and 32. Claim 31 is a representative claim of this grouping of claims. Claim 31 is as follows:

> 31. A communication system for high speed data transmission comprising:
> a light source for transmitting data as a first light signal;
> a lens having a focal length f for receiving said first light signal from said light source, said lens being approximately said focal length f from said exposed core of said large core multimode fiber optic cable,
> a large core multimode fiber optic cable, comprising:
> an exposed core having a core diameter, wherein a refractive index of said exposed core is substantially real to propagate said light signal with low loss, wherein a second light signal received from said lens at the exposed core is focused on and has a diameter approximately equal to said core diameter to reduce excitation of higher order modes; and
> a doped cladding layer around said exposed core of said large core multimode fiber optic cable that attenuates higher order modes generated in said large core multimode fiber optic cable to reduce pulse spreading effects that limit a length/data rate product, and
> wherein said refractive index of said doped cladding layer includes a complex component that attenuates higher order modes such that a third light signal output by said large core multimode fiber optic cable includes substantially only lower order modes.

A.2.i. The Proposed Combination, Considered as a Whole, Does Not Teach or Suggest All of the Features of Claim 31.

As shown above, the Examiner incorrectly cites *Numata* for teaching the claimed feature of, "a lens having a focal length f for receiving said first light signal from said light source, said lens being approximately said focal length f from said exposed core of said large core multimode fiber optic cable." In fact, *Numata* expressly contradicts the Examiner's assertion in this regard.

In addition, the Examiner ignores the feature in claim 31 that, "a refractive index of said exposed core is substantially real." The combination *Numata*, *Siegman*, and *Aoki*, considered as a whole, does not teach or suggest this claimed feature. *Numata* and *Aoki* are devoid of disclosure in this regard. Ironically, *Siegman* directly teaches away from the claimed invention regarding this claimed feature that the Examiner ignores. Regarding the real/imaginary components of the index of refraction of the fiber core, *Siegman* teaches that:

> The invention also provides a method for designing an optical fiber with a complex-valued V.sub.C -parameter. In accordance with the method the core and cladding surrounding the core are defined. *The optical fiber is doped with the active dopant such as active ions of Nd, Yb, Er or others to produce a certain doping profile. The doping profile establishes a gain g inside the optical fiber that makes a sufficiently large contribution to the imaginary part of the complex-valued V.sub.C -parameter to define at least one gain-guided mode of radiation within the fiber.* The method of the invention can be extended to further defining an index profile that establishes index-guiding or index-antiguiding. It is also possible to use no index effects at all. When working with step profiles, i.e., when the index exhibits a step index profile and the dopant exhibits a step dopant profile it is convenient to approximate the complex-valued said complex-valued V.sup.C -parameter as: [equation omitted].
>
> where a is the core radius, .DELTA.n is the index difference between the core and cladding, and .lambda. is the free space wavelength of the radiation. As noted above, it is convenient to consider instead the square of the complex-valued V.sub.C -parameter: [equation omitted].
>
> since it is then apparent that the index difference .DELTA.n is entirely responsible for the real part of the square of the complex-valued V.sub.C -parameter, *while the gain profile g is entirely associated with the imaginary part of the square of the V.sub.C -parameter*. Further details of the invention are explained in the below detailed description with reference to the attached drawing figures.

Siegman, col. 4, l. 60 through col. 5, l. 30 (emphasis supplied).

Siegman teaches that the index of refraction of the core of the fiber should have an *imaginary* component. Id. In fact, *Siegman* teaches that the imaginary index of refraction is what allows for the high gain of the fiber, Id., and thus this feature is critical to the disclosure of *Siegman*.

Hence, *Siegman* does not teach or suggest that, "a refractive index of said exposed core is substantially real," as in claim 31. Given that none of the other references teach or suggest this claimed feature, the combination of references, considered as a whole, does not teach or suggest this claimed feature. Therefore, under the standards of *In re Royka*, the Examiner failed to state a *prima facie* obviousness rejection against claim 31 or any other claim in this grouping of claims.

A.2.ii. No Rational Underpinning Exists to Achieve the Legal Conclusion of Obviousness in View of the Cited References

Additionally, no rational underpinning exists to achieve the legal conclusion of obviousness of claim 31, as required by *KSR Intl.* As shown above, *Siegman* explicitly teaches that the core of the fiber should have an index of refraction with an imaginary component. This teaching directly conflicts with the required feature that," a refractive index of said exposed core is substantially real," as in claim 31. Because the teachings of *Siegman* conflict with claim 31, in further view that *Numata* and *Aoki* contain no teachings in this regard, no rational underpinning exists to achieve the legal conclusion that claim 31 is obvious in view of the claimed references. Accordingly, under *KSR Intl.*, the Examiner failed to state a *prima facie* obviousness rejection against claim 31 or any other claim in this grouping of claims.

Still further, *Numata* also teaches away from the invention of claim 31 for the reasons presented above. Given that *both Numata* and *Siegman* teach away from the claimed invention, no rational underpinning exists to achieve the legal conclusion of obviousness, as required by *KSR Intl.* Accordingly, again, the Examiner failed to state a *prima facie* obviousness rejection against claim 31 or any other claim in this grouping of claims.

A.3. Claim 33

Applicants next address the rejection of claim 33. Claim 33 is as follows:

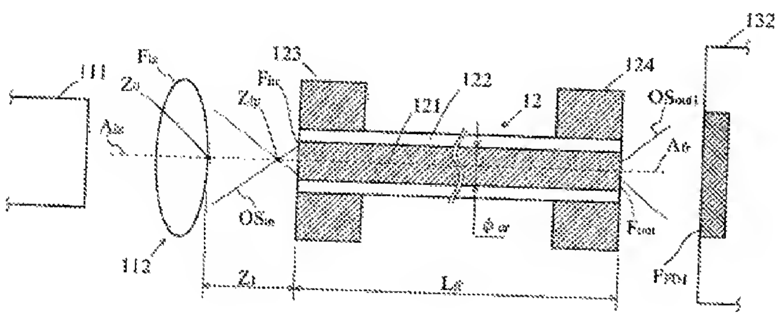
> 33. A method for increasing a length/data rate product for a large core multimode step index fiber optic cable comprising a doped cladding layer around an exposed core of said large core multimode fiber optic cable, wherein the exposed core has a core diameter and wherein the doped cladding layer absorptively attenuates of higher order modes, the method comprising the steps of:
>
> providing a data transmission comprising a sequence of light pulses;
>
> focusing said light pulses onto an exposed end of a core of the large core step index multimode fiber optic cable such that a diameter of a light pulse is approximately equal to the core diameter to minimize excitation of higher order modes in the large core multimode step index fiber optic cable; and
>
> using the doped cladding layer to attenuate higher order modes of said light pulses as said data transmission propagates down the large core multimode step index fiber optic cable to reduce pulse spreading effects that limit a length/data rate product such that second light pulses output by said large core multimode step index fiber optic cable includes substantially only lower order modes.

A.3.i. The Proposed Combination, Considered as a Whole, Does Not Teach or Suggest All of the Features of Claim 33.

The Examiner failed to state a *prima facie* obviousness rejection against claim 33 because the proposed combination, considered as a whole, does not teach or suggest all of the features of claim 31. Specifically, the proposed combination does not teach, "focusing said light pulses onto an exposed end of a core of the large core step index multimode fiber optic cable such that a diameter of a light pulse is approximately equal to the core diameter to minimize excitation of higher order modes in the large core multimode step index fiber optic cable." The Examiner relies on *Numata* as teaching this claimed feature, as neither *Aoki* nor *Siegman* teach or suggest this claimed feature.

Numata does not explicitly teach or suggest anything regarding this claimed feature in words, but does suggest otherwise in the figures. The Examiner asserts otherwise, point to paragraphs 0051 and 0055 of *Numata*. However, as shown above, these paragraphs are *irrelevant* to this claimed feature because these paragraphs deal with the defined numerical aperture ratios. In fact, as shown in Figure 2 and Figure 5 of *Numata*, the light does not have the same diameter as the core, as claimed.

FIG.2



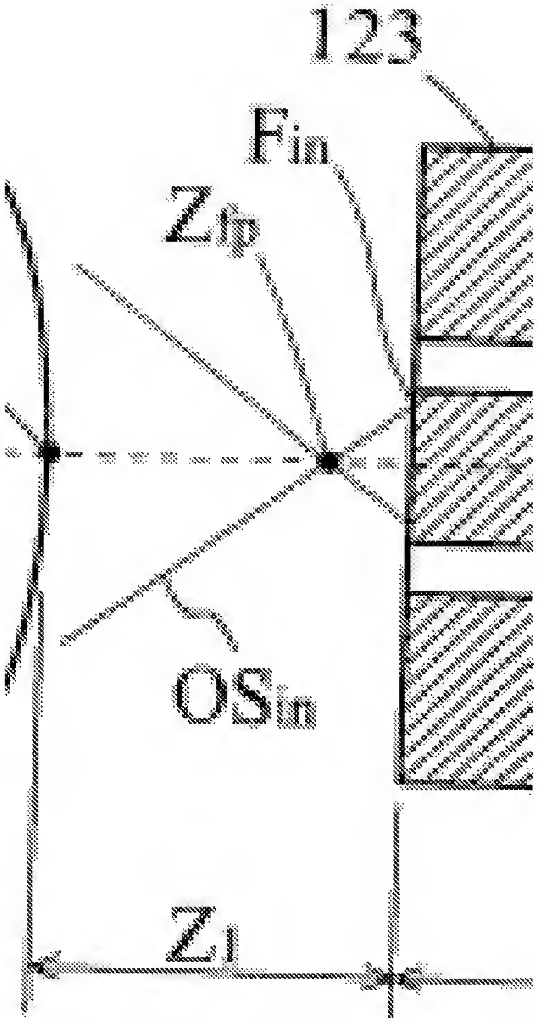
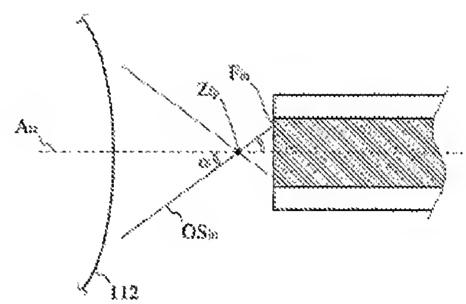


FIG.5



As shown in the blow-up of Figure 2 and also as shown in Figure 5, the diverging light rays from the focal point do not create a light having a diameter about equal to the diameter of the core. Instead, the light diverges to points that correspond to a distance less than the diameter of the core. Thus, *Numata* appears to contradict the Examiner's assertion that *Numata* teaches, "focusing said light pulses onto an exposed end of a core of the large core step index multimode fiber optic cable such that a diameter of a light pulse is approximately equal to the core diameter to minimize excitation of higher order modes in the large core multimode step index fiber optic cable," as in claim 33.

Siegman and *Aoki* do not teach or suggest this claimed feature. As shown above, *Numata* does not teach this claimed feature, but rather suggests the opposite of this claimed feature. Therefore, under the standards of *In re Royka*, the Examiner failed to state a *prima facie* obviousness rejection against claim 33.

A.3.ii. No Rational Underpinning Exists to Achieve the Legal Conclusion of Obviousness in View of the Cited References

As shown above, *Numata* and *Siegman* are contrary to the claimed invention. *Aoki* is irrelevant to the claimed invention. As a result, no rational underpinning exists to achieve the legal conclusion of obviousness of claim 33, as required by *KSR Intl.* Accordingly, the Examiner failed to state a *prima facie* obviousness rejection against claim 33.

A.4. Claims 34, 35, and 37

Applicants next address the rejection of claims 34, 35, and 37. Claim 34 is a representative claim of this grouping of claims. Claim 34 is as follows:

> 34. A communication system for high speed data transmission, comprising:
> a light source for transmitting data; and
> a lens having a focal length f for receiving light from said light source; and
> a large core multimode fiber optic cable comprising a core and a doped cladding layer around said core, wherein said lens being approximately said focal length f from an exposed core of said large core multimode fiber optic cable, and wherein a light signal from said lens is focused on and has a diameter approximately equal to a core diameter of said large core multimode fiber optic cable to reduce excitation of higher order modes, and wherein said doped cladding layer is designed to absorb higher order modes to reduce pulse spreading effects that limit said length/data rate product.

Claim 34 requires, "wherein said lens being approximately said focal length f from an exposed core of said large core multimode fiber optic cable." As shown above, *Numata* expressly teaches away from this claimed feature and expressly contradicts the Examiner's assertions in this regard.

Claim 34 also requires, "a light signal from said lens is focused on and has a diameter approximately equal to a core diameter of said large core multimode fiber optic cable." As shown above, *Numata* teaches away from this claimed feature and contradicts the Examiner's assertions in this regard.

Therefore, for the reasons given above, the combination of references does not teach or suggest all of the features of claim 34. Similarly, no rational underpinning exists to achieve the legal conclusion of obviousness of claim 34, as required by *KSR Intl.* Therefore, the Examiner failed to state a *prima facie* obviousness rejection against claim 34 or any other claim in this grouping of claims.

B. GROUND OF REJECTION 2

The Examiner failed to state a *prima facie* obviousness rejection under 35 U.S.C. § 103 against claims 23 and 29 in view of *Numata*, *Siegman*, *Aoki*, and ***Edvold.*** Claim 23 is a representative claim of this grouping of claims. Claim 23 is as follows:

> 23. The system as recited in claim 21, wherein said first light signal has a wavelength greater than 750 nanometers.

In rejecting claim 23, the Examiner states that:

> Regarding claims 23 and 29, the combination ofNumata, Siegman, and Aoki differs from the claimed invention in that it fails to specifically teach that said light source provides light having a wavelength greater than 750 nanometers. However, Edvold teaches that the industry standard for transmitting light on fiber is 1550 nm with wavelengths typically in the 1530 to 1565 nm range (column 1 lines 28-44). One skilled in the art would have been motivated to transmit a wavelength at greater than 750 nanometers in an optical system due to favorable signal loss and dispersive properties at these wavelengths (Edvold column 1 lines 27-44). Therefore, it would have been obvious to one skilled in the art at the time the invention was made to transmit a wavelength at greater than 750 nanometers in the optical system of the combination of references.

Final Office Action of November 14, 2007, pp. 4-5.

Claim 23 depends on claim 21. As shown above, *Numata* expressly teaches away from claim 21 and expressly contradicts the Examiner's assertions regarding claim 21. *Siegman* also expressly teaches away from claim 21 and implicitly contradicts the Examiner's assertions regarding claim 21. *Aoki* is irrelevant, as *Aoki* does not contain disclosures relevant to claim 21. *Edvold* is also irrelevant, as *Edvold* does not contain disclosures related to the focal length of a lens or the real/complex portions of an index of refraction of an optical cable. Instead, *Edvold* is cited merely for the proposition that the industry standard for transmitting light is 1550 nm.

In view of the fact that *Numata* and *Siegman* are contrary to claim 21 and that *Aoki* and *Edvold* are irrelevant to claim 21, the proposed combination, considered as a whole, does not teach or suggest all of the features of claim 23 – which depends on claim 21. Accordingly, the Examiner failed to state a *prima facie* obviousness rejection against claim 23 or any other claim in this grouping of claims.

C. GROUND OF REJECTION 3

The Examiner failed to state a *prima facie* obviousness rejection under 35 U.S.C. § 103 against claims 24 and 30 in view of *Numata*, *Siegman*, *Aoki*, and *White*. Claim 24 is a representative claim of this grouping of claims. Claim 24 is as follows:

> 24. The system as recited in claim 21, wherein a signal level from said light source is launched to said selected LCMFOC at 20dBM or more.

In rejecting claim 24, the Examiner states that:

> Regarding claims 24 and 30, the combination of references as applied to claims 21 and 26 differs from the claimed invention in that it fails to specifically discuss or disclose launching power to said LCMFOC at 20dBM or more. However, White teaches that this concept is well known in the art (column 7 lines lO-19). One

> skilled in the art would have been motivated to launch an optical signal at 20 dBm or more in order to compensate for the known attenuation of the signal by the fiber. Therefore, it would have been obvious to one skilled in the art at the time the invention was made to launch an optical signal at 20 dBm or greater in the device of the combination of references.

Final Office Action of November 14, 2007, p. 5.

Claim 24 depends on claim 21. As shown above, *Numata* expressly teaches away from claim 21 and expressly contradicts the Examiner's assertions regarding claim 21. *Siegman* also expressly teaches away from claim 21 and implicitly contradicts the Examiner's assertions regarding claim 21. *Aoki* is irrelevant, as *Aoki* does not contain disclosures relevant to claim 21. *White* is also irrelevant, as *White* does not contain disclosures related to the focal length of a lens or the real/complex portions of an index of refraction of an optical cable. Instead, *White* is cited merely for the proposition that launching power to the cable at 20dBM or more is known.

In view of the fact that *Numata* and *Siegman* are contrary to claim 21 and that *Aoki* and *White* are irrelevant to claim 21, the proposed combination, considered as a whole, does not teach or suggest all of the features of claim 24 – which depends on claim 21. Accordingly, the Examiner failed to state a *prima facie* obviousness rejection against claim 24 or any other claim in this grouping of claims.

D. GROUND OF REJECTION 4

The Examiner failed to state a *prima facie* obviousness rejection under 35 U.S.C. § 103 against claim 36 in view of *Numata*, *Siegman*, *Aoki*, *Edvold* and *White*.

> As noted above in the rejection of claims 23-24 and 29-30, the combination ofNumata, Siegman, and Aoki obviates the transmission of data at a rate greater than 10 Gbps. However, the combination ofreferences differs from the claimed invention in that it fails to specifically teach that the launch power is greater than 20dBm or that wavelengths greater than 750 nm are used.
>
> However, Edvold teaches that the industry standard for transmitting light on fiber is 1550 nm with wavelengths typically in the 1530 to 1565 nm range (column 1 lines 28-44). One skilled in the art would have been motivated to transmit a wavelength at greater than 750 nanometers in an optical system due to favorable signal loss and dispersive properties at these wavelengths (Edvold column 1 lines 27-44). Therefore, it would have been obvious to one skilled in the art at the time the invention was made to transmit a wavelength at greater than 750 nanometers in the optical system of the combination of references.
>
> Furthermore, White teaches that launch power greater than 20dBm (column 7 lines 10- 19) is well known in the art. One skilled in the art would have been motivated to launch an optical signal at 20 dBm or more in order to compensate for the known attenuation of the signal by the fiber. Therefore, it would have been obvious to one skilled in the art at the time the invention was made to launch an optical signal at 20 dBm or greater in the device of the combination of references.

Final Office Action of November 14, 2007, pp. 5-6.

Claim 36 depends on claim 34. In view of the fact that *Numata* and *Siegman* are contrary to claim 34 and that *Aoki*, *Edvold*, and *White* are irrelevant to claim 34, the proposed combination, considered as a whole, does not teach or suggest all of the features of claim 36 – which depends on claim 34. Accordingly, the Examiner failed to state a *prima facie* obviousness rejection against claim 36.

E. CONCLUSION

The subject application is patentable over the cited references and should now be in condition for allowance. The Examiner is invited to call the undersigned at the below-listed telephone number if in the opinion of the Examiner such a telephone conference would expedite or aid the prosecution and examination of this application.

DATE: March 17, 2008

Respectfully submitted,

/Theodore D. Fay III/

Theodore D. Fay III
Reg. No. 48,504
Yee & Associates, P.C.
P.O. Box 802333
Dallas, TX 75380
(972) 385-8777
Attorney for Applicants